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ABSTRACT

Proceedings of a 1980 seminar on university research, sponsored by the Science Council of Canada, are presented. The increasing interest of the Canadian provinces in the direct support of university research was viewed favorably, but the general feeling was that the federal granting agencies must continue to play a leading role. A. N. Bourns illustrated in his opening remarks the need for a federal-provincial partnership in the support of university research by referring to the subject of major equipment and major installations. Andre Fortier addressed the question of partnership, using as an example the funding of university libraries. While agreeing that an increase in the level of research and development in the universities is a common objective, Gilles Julien noted that it is especially important that attention be focused on the environment for research. Donald Savage referred to the program of exchanges with China as an example of federal-provincial politics interfering with the development of effective programs. Regarding the matter of provincial support for research, D. B. Ogaranko noted that the Council of Ministers of Education is examining the methods and the effectiveness of provincial support for research. Rene Simard suggested that the Science Council Report 31, "University Research in Jeopardy: The Threat of Declining Enrolment," failed to deal with the causes underlying the present crisis in the universities. Comments of other participants made in the general discussion and concluding remarks by Leo Yaffee are also included. Recommendations of Report 31 and a seminar agenda are appended. (SW)

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INTRODUCTION

The origin of the Science Council Report 31, University Research in Jeopardy: The Threat of Declining Enrolment, goes back to November 1976, when the Council's Task Force on Research in Canada took the occasion of the meeting of the Association of Universities and Colleges of Canada in Regina to issue a Statement of Concern, entitled Erosion of the Research Manpower Base in Canada.

The Task Force's concern had arisen from its consideration of the consequences likely to follow from the decrease in university enrolment expected to take place in the early 1980s. Projections by Statistics Canada had shown that, after more than two decades of continuous and sometimes rapid growth, the size of the 18 to 24 age group, from which most university students are drawn, would peak about 1982 and then, within about a decade, fall by about 20 per cent. The participation rate of this age group had also risen dramatically during the 1960s, but during the 1970s had been relatively constant. Thus, it seemed reasonable to assume that overall university enrolment would level off as we entered the 1980s and then, beginning about 1982, would fall by about twenty per cent.

In some situations, a decrease of 20 per cent spread over a decade would cause no problems, but the Task Force noted that the anticipated decline in university enrolment would mean, "If current policies... persist, we must face the prospect of a period... during which very few posts in research and teaching will be filled by young recruits. Thus the research work force would continue to be deprived of fresh talent, and would age rapidly."

Such a prospect, it felt, was unacceptable, and so, to assist it in formulating measures to come to grips with the problem, the Task Force, in collaboration with the Association of Universities and Colleges of Canada (AUCC), held the "Workshop on the Optimization of Age Distribution in University Research" on 13 and 14 June 1977, in Ottawa. The workshop served to confirm the concerns of the Task Force, and to convince it of the need for further studies. Eventually, it was decided that a Council policy document should be prepared. This was released to the public as Science Council Report 31 on 25 February 1980.

The Report makes it clear that the task of preserving and enhancing the quality of university research in the 1980s cannot be left to the universities themselves. While they have an important and difficult role to play, so do the provinces and the federal granting agencies. It seemed logical, therefore, once it had been decided to hold a seminar, to invite representatives of these three sectors to serve as members of a panel.

The universities were represented by Dr. A.N. Bourns, President of McMaster University, on behalf of the AUCC, and Dr. Donald C. Savage, Executive Secretary of the Canadian Association of University Teachers. The provinces were represented by Mr. D.B. Ogaranko of the Department of Advanced Education and Manpower of Alberta, on behalf of the Council of Ministers of Education. The federal granting agencies were represented by Dr. Gilles Julien, Executive Director of the Natural Sciences and Engineering Research Council; Dr. René Simard, President of the Medical Research Council; and Mr. André Fortier, President of the Social Sciences and Humanities Research Council.

Each of the members of the panel was invited to make an opening statement, and these are reproduced, essentially verbatim, in these Proceedings. After a brief period for discussion among members of the panel, the seminar was thrown open to a general discussion. This was begun by comments from a special guest, the Honourable Douglas

McArthur, Minister of Education and Continuing Education, Saskatchewan. In the interest of brevity, the remarks of those who participated in the discussion among members of the panel and in the general discussion are presented in summary form.

As will be evident to the reader, the opening statements and the discussion reflected a wide range of views and perceptions regarding problems likely to be faced by our universities in the 1980s. In some cases, the Science Council Report served as a launching pad for considerations extending beyond the scope of the Report. In a few cases, the commentators would have benefited from a more careful reading of the Report. Nevertheless, the seminar was characterized by a common feeling of deep concern for the health and role of our universities as they face the challenge of the shrinking cohort. Serious doubts were expressed about the ability of the universities to undertake, on their own initiative, the kind of rationalization that was clearly needed and had been proposed in the Report. The increasing interest of the provinces in the direct support of university research was looked upon with favour, but the general feeling was that the federal granting agencies must continue to play a leading role. Of overriding significance was the view, expressed time after time, that the resolution of the problems and challenges of university research can only be achieved through a partnership in which there is joint, concerted action on the part of the two senior levels of government.

In closing, I wish to express my thanks, on behalf of the Science Council, to the panelists and to all who participated in the discussion. Also, my thanks to Dr. D.J. Le Roy who helped in organizing the seminar and, with the assistance of Paul Dufour, in preparing these Proceedings.

Maurice L'Abbé
Executive Director
Science Council of Canada

OPENING STATEMENTS BY MEMBERS OF THE PANEL

REMARKS by Dr. A.N. Bourns, President of McMaster University

Thank you very much for the invitation to participate in this important seminar on the recently published Science Council Report.

Although I am billed as representing the Association of Universities and Colleges of Canada (AUCC), I make no claim that my views are representative of the members of the Association. Indeed, quite the contrary, if my experience on the Council of Ontario Universities is any indication, some of my comments on research funding are likely to be at variance with those of many of my presidential colleagues. I am afraid that I am more comfortable wearing my scientist and Natural Sciences and Engineering Research Council (NSERC) hats than that of AUCC.

My first comment, however, causes me no such problem. I am confident that I speak for most readers of the Report when I state that it presents an extremely well-written and penetrating analysis of the difficulties that will be facing the universities during the next decade as a result of demographic change. Furthermore, I find little in the list of recommendations to which, in principle, I take exception. The problems of implementation, however, are quite another matter, especially with respect to recommendations requiring certain institutions to withdraw voluntarily from activities in which they are currently engaged. Cooperation and consolidation of effort are most commendable objectives; their achievement can be extraordinarily difficult. But I shall come back to this later in my remarks.

The only recommendation directed specifically to AUCC is the first, which urges a major study, in cooperation with the Canadian Association of University Teachers (CAUT), on turnover of academic

staff and the factors involved. I believe that this study is worth doing but I question, in view of the extensive literature on the subject such as Academia in Transition,* whether it needs to be a major undertaking. Furthermore, in conducting such a study, it is important to keep in mind that the objective is to find ways and means for strengthening, through faculty turnover, the total research effort of our universities. If proposals coming from such a study are seen to confer on faculty financial benefits significantly greater than those found in most other sectors, they will lack credibility and public support.

Portability of pensions has been a perennial issue, and it now needs to be tackled as a matter of urgency in any study of staffing in the 1980s. In the case of senior academics, however, pension portability problems need not be the most serious deterrent to mobility, since ad hoc arrangements usually are not too difficult to make. The fact of the matter is that, in the present financial climate and with the present faculty age distribution, hiring a junior person is a much more attractive proposition, when vacancies arise.

Turning to Recommendation 4:

> Inter-university transfers of staff and facilities should be undertaken whenever research and/or teaching in a specialized area falls below the critical mass for productive scholarship in a particular university.

I am strongly supportive of the concept of critical mass in graduate study and in research. But after four years of experience with graduate planning in Ontario under the aegis of the Advisory Committee on Academic Planning (ACAP) and the Council of Ontario Universities (COU), I am not at all sanguine that very much can be accomplished. It is quite unlikely that a university senate would be

* Carl V. Patton, Academia in Transition: Mid-Career Change or Early Retirement, Abt Books, Cambridge, Massachusetts, 1979.

prepared to cease enrolling PhD students in a certain area and to reduce its faculty accordingly; even if it were, where are these faculty to go? Although other institutions with stronger programs may be in a position to recruit new faculty, they will understandably wish to cast their net as widely as possible.

Perhaps my experience over the years has made me too much of a pessimist, yet I have to state candidly that whenever I have heard proposals - in NSERC, in provincial councils of universities, or in university senates - that would help to bring about a greater concentration of resources, the invariable cry is, "but that will make the strong stronger and the weak weaker." The response, that in the present financial climate this is precisely what must be done if we are to maintain and enhance the quality of university research, is not readily accepted in many quarters.

In this context, I would like to commend the authors of the Report for emphasizing that NSERC, in reviewing applications for its research associateships, must assess not only the candidates' qualifications but also the departments or research groups in which they would be working.

I would now like to turn briefly to three points relating to university research funding by the two levels of government.

Until very recently, there has not been a clear recognition by decision makers of the partnership relationship that should exist between the provincial governments which, through their operating grants to universities, support the infrastructure for university research, and the federal government which, primarily through the granting councils, funds the direct costs of such research. Dr. Le Roy can correct me if I am wrong but, with the exception of Quebec, the National Research Council (NRC) had very little communication with provincial governments on university matters.

In my view, this partnership must be recognized in very concrete operational terms if universities are to have the capacity to respond to the research opportunities of the 1980s. There is very little point in NSERC mounting major new research initiatives such as the Strategic Grants Program, if the basic infrastructure of faculty, library, computer capacity, etc., is being continuously eroded by inadequate provincial funding. Communication and cooperation between the two levels of government are absolutely essential if we are to achieve the greatest return on our investment. Mechanisms should be developed that will allow NSERC and the other granting councils to work directly with the responsible provincial bodies in developing and implementing appropriate research strategies and programs.

My second point is to commend strongly the authors of the Report for their perceptive comments on the difficulty, indeed impossibility, of sustaining a strong research base in universities during a period of enrolment decline, if both the total funds allocated by a province for its universities and distribution mechanisms are based primarily on student numbers. Unless there are changes in funding formulas to take into account the relative research capacity of institutions, university research will indeed be in jeopardy. But to do so will make the strong stronger and the weak weaker. I have already commented on this dilemma.

Finally, although there is merit in the recommendation that provinces should establish Chairs in their universities, I do not believe this is the only or even the best means for encouraging research in areas of particular relevance to provincial needs. For example, I would ask whether the total research effort in the Alberta universities on the tar sands would have been greater if AOSTRA had concentrated its support in a single university centre of excellence rather than to establish Chairs at three separate institutions. I suggest this question should be explored when such research Chairs are being contemplated.

REMARKS by André Fortier, President, Social Sciences and Humanities Research Council

I am pleased indeed that the Science Council should have invited the Social Sciences and Humanities Research Council to participate in this panel. It marks a welcome opening up of discussion in a field that is still hardly addressed in the many analyses of the contributions of research to society. In this neglect of the human sciences, this latest Science Council report is no exception. I regret this, as I know you do, more especially as my Council is not well enough equipped to fill the void - though in truth I am not at all sure that that is our function. It would be much more useful, in my view, if the social - and even cultural - values that inform our society could be taken into account in the Science Council's analyses.

I have been asked to comment on the Report from the point of view of the social sciences and humanities, and I shall try to emphasize some points of convergence, of divergence, and of parallel thinking, as I see them, between our studies and this report. My presentation is divided into three parts. First, I shall comment briefly on the Overview in Chapter I; then I shall show some statistics that reflect the research effort in the human sciences, translated into terms of people and of dollars; and, finally, I shall say a few words about the recommmendations of the report and other recommendations that might apply to our situation.

The Overview

To an outside observer, what first strikes the reader about this chapter, and the Preface, is the almost absolute equating of science and technology and economic development on the one hand, with social and cultural development on the other. This is illustrated quite

sharply in the Preface, which states at the outset that there is "evidence of the need for scientific and engineering solutions to a wide range of national problems," and in the two first pages of the Overview chapter, where this same leitmotif recurs in one form or another throughout. Now I would be the last to belittle the importance for the well-being of society of technological development brought about through scientific progress. But I should nevertheless like to stress that this well-being could have been greatly enhanced if research in the human sciences had progressed at the same rapid pace as that of the natural sciences, medical sciences and engineering. We in the human sciences are 40 years behind, if we consider that the National Research Council was established in 1917, while the Canada Council - whose mandate was to develop the humanities and social sciences (before the division which gave birth to our Council two years ago) - was founded in 1957. Social and cultural problems, I think it is clear, are not all of an economic order, nor does their solution always depend on technological progress. On that, I think, we can all agree - even if we seem to have trouble articulating the fact.

What is still more important, in my view, is that there ought to be a direct link between development in the natural sciences, and that in the human sciences, so that through the interaction between the two we could, on the one hand, avoid the disastrous deviations in societal value systems occasioned by incoherent technological development, and on the other hand, derive the maximum benefit from such development through a better understanding of society.

A few specific examples come to mind. The development and all-pervasiveness of electronic communications technology has had a significant impact on the value we place on individual and community identity. The cultural melting pot this technology may tend to foster is closely linked, I believe, to the ethnic and regional tensions which characterize so much of our contemporary society. Automation is another area of development which has given rise to conflicts and

anxiety. Yet how little we know about the relations between individuals and groups; or about the nature of calm, or of fear, which are the alternate warp and woof of the fabric of individual human existence. To cite another example, it is patently clear that our energy future lies in the direction of a stepping-up of production and a control of consumption through prices. But should we not be reflecting rather on the societal values which are demanding such enormous consumption of our scarce and dwindling energy resources? Will it always be necessary to reach the point of a threatened world cataclysm, engendered by our overreaching appetites, to make the vital switch in a value system that is spawned and fostered by scientific development from which the human sciences are too often excluded?

The Social Sciences and Humanities Research Council (SSHRC) summarized its thoughts, thus, in the foreword of its first annual report:

> "The natural sciences and technology may alter the course of human events and change the order of things, but the social sciences and humanities seek to understand why events take place. They help man to adapt to the changes he has brought upon himself and to go beyond what he has achieved rather than to worship the wordly gods he has wrought. Enlightened by the values entrenched in the history and the nature of man, the social sciences and humanities suggest a rational way of thinking and of judging things and events, weigh current problems against the past and open new vistas to the future."

In concluding this first part of my presentation, I should like to stress that my preceding remarks are in no way intended to call into question the conclusions of the Science Council Report. Following Chapter I, the Report swiftly tackles specific issues, which, as we shall see, have every bit as serious an impact on research in the human sciences as in the others. It appeared to me to be opportune, however, to begin by raising my voice a little on behalf of research in the

social sciences and humanities which, unfortunately, is all too often ignored.

Some Statistics

In order to understand better the position of the human sciences in relation to the natural sciences and to show the relevance of the Science Council's Report to the human sciences, tables and graphs will be useful.

TABLE 1 - Total Expenditures on R&D, 1971-1977 ($ Millions)

	Natural Science R&D			Human Science R&D		Total R&D	
	GNE	GERD	Ratio (2)/(1)	H.S.	Ratio (4)/(1)	Total R&D	Ratio (6)/(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1971	94 450	1 161.9	1.23	158.9	.17	1 320.8	1.40
1972	105 234	1 184.4	1.13	163.4	.16	1 347.8	1.28
1973	123 560	1 279.6	1.04	170.4	.14	1 450.0	1.17
1974	147 528	1 472.3	1.00	198.3	.13	1 670.6	1.13
1975	165 343	1 666.0	1.01	226.7	.14	1 892.7	1.14
1976	191 166	1 775.5	.93	258.8	.14	2 034.3	1.06
1977	209 379	1 998.3	.94	283.5	.14	2 281.8	1.09
1978	230 407	2 177.6	.94	305.6	.13	2 483.2	1.08

Note in Table 1 that R&D in the human sciences has suffered the same decline in relation to Gross National Expenditure during the '70s as that in the natural sciences. The percentage of R&D in the human sciences has held at around 12 per cent of total R&D expenditures during this period. With a government strategy aimed at R&D development at the level of 1.5 per cent of GNE, or even 2.5 per cent, and focussed on industry and technology, one might ask what the current percentage for the human sciences might become. Personally, I believe that it might be reduced by half, unless a special effort is made. Would that be very wrong? At what level should R&D expenditures on the human sciences be fixed to assure an equilibrium?

TABLE 2 - University Research by Source of Funding, 1978 ($ Millions)

Source of Funding	Human Sciences		Natural Sciences	
	$	%	$	%
Universities	164.3	77.6	292.6	52.7
Other	47.4	22.4	262.6	47.3
Total	211.7	100.0	555.2	100.0

Table 2 shows how much more is spent in universities for R&D on the natural sciences than on the human sciences: more than two-and-one-half times. The amounts expended by universities are in the form principally of indirect costs representing the proportion of salary and other costs which correspond to faculty research time. Incidentally, from estimates made by the Canadian Committee on Financing University Research it has been calculated that 45 per cent of faculty time in the natural sciences is given over to research compared with 26 per cent in the human sciences. What is especially striking about this table is the small amount of external funding for human science research in the universities compared with the natural sciences: six times less.

TABLE 3 - Universities as Performers of R&D, 1971-78

	Human Sciences	Natural Sciences
	%	%
1971	77.5	26.6
1972	74.1	26.1
1973	71.5	25.2
1974	71.8	25.1
1975	72.2	26.2
1976	70.1	26.8
1977	69.1	25.7
1978	69.3	25.5

Table 3 shows clearly the importance of universities as performers of R&D in the human sciences. Unlike the situation for the natural sciences, expenditure statistics on R&D in the human sciences are not available for the private sector. It is expected that even if allowance were made for these, the amount of R&D in the human sciences performed by the universities would still be over 50 per cent.

TABLE 4 - Growth in University Enrolment and Faculty, 1962-1977

	Full-Time Undergraduate Enrolment		Full-Time Graduate Enrolment		Full-Time Faculty	
	No.	%	No.	%	No.	%
Human Sciences						
1962-63	86 383	65.6	3 923	47.6	3 921	49.7
1970-71	166 155	64.0	18 225	59.4	14 154	57.5
1976-77	191 971	63.4	22 070	65.5	17 997	57.4
Natural Sciences						
1962-63	45 272	34.4	4 311	52.4	3 969	50.3
1970-71	93 328	36.0	12 468	40.6	10 440	42.5
1976-77	110 655	36.6	11 631	34.5	13 352	42.6

Note that the proportion of undergraduate students in the two groups of fields changed very little. The distribution of graduate students, however, changed dramatically after 1962-63, the percentages now being approximately the same as for undergraduate students. Among the graduate students in the human sciences one can see real progress from 1962 to 1977. This is probably the explanation for the greater increase in the number of faculty in the human sciences compared with the natural sciences, as indicated in the last column of the table. Note, in addition, that for 1976-77 the percentage of faculty in the human sciences was less than that of students, which seems to confirm

the results of the study on faculty research time noted in connection with Table 2.

The number of faculty members, it is interesting to note, increased more rapidly than the number of students during 1962-1977. In the human sciences, there were four-and-a-half times more professors, while the number of undergraduate students increased by a little more than twice, and the number of graduate students increased by five-and-one-half times. In the natural sciences, the number of undergraduate students increased by two-and-one-half times, that of graduate students by about three times, and that of faculty by more than three times.

Comments on Recommendations and Conclusions of the Science Council Report

The Science Council Report states unequivocably that we can foresee a decline of some 20 per cent in the number of university students between 1982 and 1994,* leading to a reduction in teaching staff - even if the latter might in fact suffer a reduction of less than 20 per cent. We are in no position either to confirm or dispute this conclusion for the social sciences and humanities. Parallel changes in the number of undergraduate students during the last 15 years, as shown in Table 4, lead us to believe that the crisis in the human sciences will be as serious, though it is possible that it will be even more serious on a short-term basis. We have calculated that in 1974-75 there were more faculty below the age of 35 in the human sciences (35 per cent) than in the natural sciences (28 per cent). This would indicate that the impact of retirement on the recruitment of new teachers in the human sciences will be less within the next 15 years.

Be that as it may, I believe that the conclusions of the Science Council Report vary little from ours in their application to the human sciences. They are in the spirit of the strategies we proposed our-

* It doesn't. Ed.

selves in our five-year plan published last year - strategies that we hope to put into action from now until 1984-85, but that will only be a prelude to probably even bolder ones planned for the following five years. The recommendations of the Science Council Report will be useful to us in carrying out these initiatives.

I should like to draw attention to Recommendation 8, which suggests that the Natural Sciences and Engineering Research Council should establish a program of Research Associates analogous to the Scholarships of the Medical Research Council. I believe that this recommendation could be applied as well to the Social Sciences and Humanities Research Council. It would, in fact, come close to complementing a new Postdoctoral Fellowships program to which we have given priority, and a program of grants for research time, which would permit a professor-researcher to free himself from his teaching duties at a crucial point in his research. On this note, too, our Council's Leave Fellowships, complementing sabbatical leave, are generally considered as excellent means of maximizing research effort in the human sciences. Such grants certainly encourage the research thrust which the Science Council Report stresses so strongly. We are also looking at the possibility of creating grants for senior researchers of more than usually outstanding ability.

In our Negotiated Grants and Strategic Grants programs, we permit researchers to devote their full time to their research. We are now also examining the possibility of supporting research centres of excellence under the same conditions.

Finally, I should like to mention our projected program of scholarly visits and exchanges, which falls in line with the Report's Recommendation 4,* in providing for reimbursement of travel and subsistence costs of exchange scholars. In such a program, I would hope to see a system whereby the exchanges would not necessarily be

* See p. 81 of these Proceedings.

strictly reciprocal, so that small universities could benefit from exchanges with larger ones.

In sum, our Council is clearly already embarked on the path indicated by this report, even if all of its specific recommendations are not necessarily applicable to the human sciences. What we lack, however, is the explicit support of the Science Council so that all these many strategies might be realized through the growing support of government and the entire university community.

REMARKS by Gilles Julien, Executive Director, Natural Sciences and Engineering Research Council

Alfred P. Sloan, Jr., the legendary chief executive officer and chairman of General Motors for over two decades, is reported to have said at a meeting of one of GM's top executive committees, "Gentlemen, I take it we are all in complete agreement on the decision here." Everyone around the table nodded assent. "Then," continued Mr. Sloan, "I propose we postpone further discussion of this matter until our next meeting to give ourselves time to develop disagreement and perhaps gain some understanding of what the decision is all about." Mr. Sloan knew that before one could arrive at the right decision, a certain degree of disagreement and controversy between various opinions, arguments and interpretations was essential.

This anecdote, Mr. Chairman, came to mind immediately when I started reading the Science Council Report. I was obviously very pleased and flattered to see the extent to which our Five-Year Plan has already responded to (or has anticipated?) the main thrusts of the recommendations of your Council. Many of the measures the Report is calling for are already underway at NSERC, while the remaining recommendations, which were not directed specifically at NSERC, have our full support. In short, we find ourselves in complete agreement with the decision, just like the executives at the GM committee meeting. And just like Mr. Sloan, and for the same reasons, I would like to review some of the assumptions and arguments in order to gain a better understanding of the problem.

It is generally agreed that the demographics of higher education in our universities over the next 15 years present a rather dismal picture. As several studies recently have appeared with roughly the

same conclusions, it may be the right time now to step back once more and to review in a somewhat critical sense the facts of the situation. The facts as they relate to demographic projections are the following: data on actual live births, estimated future fertility rates and assumed further immigration rates lead to projections of the number of people of university age (historically assumed to be between 18 and 24 years old). From these projections of the number of people of university age, university enrolment is estimated from historical enrolment ratios. Then, from these enrolment projections, estimates are made of the number of faculty required to educate and train these students, adding another assumption, namely, that the student-teacher ratio will remain constant. From this estimate of the total demand for faculty, the age structure of the current faculty and the present retirement age, guesses are made about the demand for new faculty. It is important to remember that the only firm fact in this entire projection of the demand for new faculty over the next 15 or 20 years is the total number of live births in Canada in recent years; all the rest is, to some extent, guesswork involving a large number of assumptions, each containing considerable uncertainty. If we assume that every parameter, rate or ratio will remain constant over the next 15 to 20 years, i.e., if we assume the status quo, we will get the scenarios outlined in NSERC's Five-Year Plan and in the Science Council study. What we should keep in mind, therefore, is that these scenarios are highly speculative and uncertain, that the declines projected for the eighties are especially dramatic in comparison with the rapid expansion of the sixties, and that they appear very dramatic indeed if the worst possible outcome of current trends is envisaged. But it just might happen that way.

Now suppose that indeed all our assumptions are correct and that the number of faculty will decline, perhaps by about 20 per cent. What would be the effect on research and teaching? The number of university jobs will decline, but is the effect on productivity in teaching and research output proportional to the decline in numbers? One can argue

that the decrease in productivity and output will certainly be less than 20 per cent, and that perhaps the overall effect on the quality of teaching and research may even be positive. Will the quality of those entering university positions decline? It is my estimate that the best and brightest are proportionately more likely to continue their training towards an academic career, which should enhance the average quality of the new professors. Admittedly, many top young people may decide to switch their careers to industry because of the decline in the number of available university-based jobs. But, if we take a wider view of our national economy, we have to admit that this is a very desirable development. Without a strong economy to provide the financial resources and to put university research results and research-trained manpower to work, the university research enterprise will be in real jeopardy.

What about the effect of aging faculty researchers? We know that in the past the participation rate in NSERC's programs declined with increasing age of the researchers, presumably because these senior researchers went on to administrative and managerial positions in the universities or confined themselves to teaching. But as these opportunities for progression through the ranks will be in short supply as well, will the participation rate continue to decline with age? This is not at all certain and, therefore, the number of researchers may not decline as much as the 40 per cent decrease in full-time equivalent research manpower projected in our plan. But it just might happen that way.

What about the effect of aging on the individual productivity of the researchers? There is nothing in NSERC data to suggest that older researchers, who have been able to stay in close touch with the outside world beyond their particular discipline and their university, are any less productive than their younger counterparts. In fact, our data indicate the opposite: older researchers are amongst our top grantees. This suggests that scientific productivity is perhaps related more to

the personality, temperament and leadership of the researcher than to his age.

The existence of a strong link between good teaching and good research has not yet been established on a firm base by very decisive arguments, although it is recognized that this linkage is generally beneficial. But how essential is it? In the absence of proof of the necessity of this linkage, does a decline in the number of teaching jobs then inevitably have to imply a corresponding decline in research jobs in the universities? Succeeding governments have indicated that the level of R&D in real terms in Canada should double or even triple over the next 5 to 10 years. But even if this level remains constant in the foreseeable future, should an increase in new research jobs in universities, which will indirectly compensate for the decline in old teaching jobs, be ruled out? Will university research, therefore, perhaps not suffer at all?

These issues, Mr. Chairman, are very complex and their magnitude and effects are highly uncertain at this time. The Science Council study commendably addresses some of these difficult questions head on. NSERC, in the development of its plan, has also grappled with many of the same questions. From the many uncertainties, one thing has become very certain: the future of our universities will be very different. And declining enrolments are perhaps a symptom rather than the cause of the problems most universities are facing or will have to face in the future.

I have reviewed very briefly some of the questions often taken for granted in discussions about the magnitude and the effect of declining enrolment. We have to remind ourselves continuously of the many tentative premises, shaky assumptions and large uncertainties on which our projections are based, so that we are not tempted to push the panic button too readily. NSERC's response to the perceived problems is in full recognition of the fact that its projections and analyses are highly speculative, and that the issues and changes affecting univer-

sity research go well beyond a decline in enrolment. In order to avoid perhaps more disastrous problems by overreacting to one of the major symptoms, its response has been to develop highly flexible programs. NSERC's response is not to fight the seemingly inevitable decline in numbers, but to facilitate the transition to perhaps a smaller, but undoubtedly more relevant, more dynamic and, on the average, more productive research force in our universities.

There is a danger in the current preoccupation with the projected number of students, the number of researchers and the number of professors, as this tends to distract from considerations of their quality. If many of the best students and researchers are turning away from the universities, the resulting deprivation of the best talents is potentially far more damaging to the health of the university research enterprise than the effect of declining numbers. Council is, therefore, very much concerned with ways and means to retain and to cultivate the quality of students and researchers and is to a lesser extent concerned with attempts to maintain or increase their numbers. Council's plan reflects this emphasis on quality, on measures to improve the overall research environment and research equipment base in universities, on measures to encourage the best and the brightest to continue to do research in universities, if necessary in temporary non-faculty positions, on measures to expand and strengthen significantly the university/industry interface and our industry-oriented support programs.

In closing, I would like to repeat my earlier statement that I am very pleased with the main thrusts of the recommendations of the Science Council. With regard to specific recommendations directed to NSERC, our NSERC Research Fellowship program to be launched this summer is very similar to the proposed Research Associates program (Recommendations 8 and 9), and our targeted and industry-oriented research and manpower programs, which are under detailed study at the moment, are likely to go well beyond the scope of the initiatives

proposed in Recommendations 10, 11, 12 and 13. But above all, it is our intent to maintain maximum flexibility in the magnitude, direction and focus of our new programs; to attract, encourage and support the very best students and researchers; and to assist universities in their efforts to create and maintain the environment in which the best can flourish in adequate numbers.

REMARKS by D.B. Ogaranko, Alberta Department of Advanced Education and Manpower

The Chairman of the Council of Ministers of Education, Canada, the Honourable Patrick McGeer, was requested to represent the Council at this seminar. Regrettably, he could not come, but nonetheless he wished to have the Council represented. Dr. Kolesar, my Deputy Minister from the Alberta Department of Advanced Education was subsequently invited. He too was unable to attend, because today the provincial government budget is being presented in the Legislature.

Both gentlemen extend their apologies for being unable to be here today. I hope that on their behalf, I am able to represent adequately the provincial perspective in this significant discussion concerning university research.

Before proceeding with my comments, I would like to inform the members of the panel and the audience that I do not bring an official view of either the Council of Ministers of Education of Canada or the Government of Alberta on this topic.

Instead I will attempt to present a generalized provincial perspective concerning research and universities; one that will contribute to this discussion, yet not violate the range of provincial orientations held on this matter.

I trust the audience will forgive my heavy reliance on Alberta examples to illustrate my presentation. While I recognize that Alberta is not considered a typical Canadian province, I was hard pressed to find one more typical.

Overview of the Document

I would like to begin by presenting a brief overview of my understanding of the Science Council Report and the manner in which it relates to the broad research and development issues under discussion in Canada today.

Pre-eminent among Canada's current concerns is the need to resolve our economic problems. While these economic problems are complex and require a multitude of solutions, an important role in this regard can be played by an expanded research and development effort within our country.

In turn, our universities are the site of most of our basic, and a good proportion of our applied research, as well as being the chief suppliers of the highly qualified manpower required for research and development. The Report suggests that these institutions should expand their research endeavours.

However, this potential contribution by our universities is in jeopardy. Declining student enrolment and staff appointments at Canadian universities threaten to create, as the Report states, "second-rate institutions unable to generate new concepts and to train the manpower required to solve the complex scientific, technological, and economic programs of the future."

To prevent the educational clocks from being turned back, the document proposes a series of recommendations to be considered by the universities, both levels of government, and by the private sector.

Based upon this understanding of the issues, I would like to offer the following comments, representative of a provincial perspective on this subject.

Provincial Perspective on Research and Development

Few, if any, provincial governments would disagree with the statement that Canada's economic problems require attention and that they can be

assisted, in the long term, by an improved research and development effort. Indeed, for most provinces, research and development have recently not only become increasingly important issues, but also increasingly important means for addressing other provincial areas of responsibility. To this end, many provinces have created new authorities responsible for supporting research, and have made increased funds available to promote this research activity. The major challenge now, it seems, is to improve the effectiveness of this expanding research and development effort.

Provincial Perspective on the Role of Universities in Research

The provinces agree that our universities play a vital role in performing most of Canada's basic research and a good portion of our applied research, as well as being the prime suppliers of our highly qualified scientific and engineering manpower. The provinces have long supported basic research in the universities through the provision of operating grants, and at times through research grants. They also have encouraged the universities to participate in applied research by making available to them contract funds with which to pursue research of particular importance to the province.

Alberta has recognized that universities perform a valid function in the area of research as well as in teaching and community service. Reflecting this perspective, Alberta has long since left the per-student grant formula basis for funding its institutions of higher learning. Since 1976, and in spite of limited increases in student enrolment, the universities in Alberta have been receiving, under the base-plus-increment mode of funding, annual operating grant increases ranging from 8.2 per cent to 11 per cent.

Is this shift in the manner of funding universities adequate to provide them the kinds of operating grants they require? Or are they still operating under "financial restraint" as suggested in the Science Council Report? How much is "enough"? Are there any institutions in our society which are operating under adequate financial resources?

Provincial Perspective on the Role of Universities in Research and Development

To express an opinion on the role of universities in Canada's recently regenerated interest in research and development is to comment on the role of universities in aiding Canada to solve its current economic problems. Few provinces would deny that our universities have a role to play. The question is, how involved should they become?

While recognizing the significance of basic research, provincial governments have recently also been increasing their support so universities will undertake research in aid of contemporary provincial issues and areas of responsibility. This perspective has often been mistaken by the university community as being declining concern by the provinces for the general support of scholarship and research. The opposite is true. The provinces continue to promote scholarship, at both the basic and applied research levels. However they are also attempting to link this support for scholarship and research to areas of provincial concern.

In Alberta, the provincial government has initiated support for a wide spectrum of research alternatives, available to universities in both Alberta and in other provinces. For example, with the establishment of the Medical Research Fund of $300 million, the research community will be able to indulge its curiosity-oriented, basic-research interests in this area for a full five years before an accounting will be taken. At the other extreme, agricultural researchers, already mission-oriented in their research outlooks, will be expected to continue their activities at an expanded rate under the $20 million Farming-for-the-Future Research Program.

The Alberta Oil Sands Technology and Research Authority, with a total budget of $250 million in support of research and development concerning conventional and nonconventional oil resources, offers a highly diversified range of support for researchers at Canada's universities, ranging from basic to applied research, from graduate scholar-

ships and postdoctoral fellowships to professorial chairs. Monies are also available to private individuals, private companies and members of provincial research councils.

In all, Alberta is currently undergoing a massive experiment in devising different ways to support research at the university level.

Declining University Student Enrolment and Staff Appointments

To a varying degree, the universities in various regions of Canada are expected to experience declining student enrolment and staff appointments in this decade. Action is required by these institutions, if they expect to alter this trend.

From the university perspective, it appears that operating grants from the provinces will grow at a predictable rate, while new funds from both the federal and provincial governments will be forthcoming to support the research enterprise. It also appears that, if research and development continue to be viewed as a means for solving Canada's economic difficulties, the universities will be enticed to do more mission-oriented research, both basic and applied. These altering funding arrangements and research incentives will change the character of the universities as we know them. As I see it, the universities are at a turning point.

Contrary to the tone of the Report, neither university research nor the future of the universities are in irreversible jeopardy. I have illustrated at some length how one provincial government has recognized the diversified role of the university and is attempting to support it in all functions as well as to promote university research in matters of interest to the province. To a greater or lesser degree, other provinces in Canada appear to be operating similarly.

The Report is correct in suggesting that from a demographic perspective, enrolment at the universities is likely to decline. But the other element of the enrolment equation - participation rates - can be altered. I feel they can and will be improved during the 1980s.

Why am I so positive? While the state of the Canadian economy is currently in some difficulty, a better future is possible. For example, if the mega projects being planned in Alberta proceed as planned, Alberta will be able to provide only 60 per cent of the required labour supply. The remainder, in all occupational sectors, will be expected to come from other provinces or from abroad. Surely graduates from universities across Canada will also have an opportunity in Alberta, if none exists immediately at home.

Another example, more specific to the issue of highly qualified scientific and engineering manpower, is one concerning the Alberta Research Council. According to its Five-Year Plan, recently approved by the Alberta Government, the Council will be expanding its staff of highly qualified scientific and engineering manpower from the present contingent of 160 to 285 by 1984. It appears unlikely that this addition of 125 highly qualified personnel can be filled from within Alberta; nor can the 335 additional support staff who will be required to facilitate the expanded operations of the Council. How many additional opportunities are emerging for Canada's highly qualified manpower? What are the universities doing to inform young Canadians that a university education is not only desirable but from a career perspective, highly practical?

REMARKS by Dr. Donald Savage, Executive Director, Canadian Association of University Teachers

At its meeting a week ago, the CAUT Board had the pleasure of having Dr. Le Roy discuss the Report. I, myself, have had the opportunity of discussing it with the members of one of our committees engaged in reviewing the recent publication Room at the Bottom,* which addresses some of the concerns expressed in the Science Council Report. My remarks this morning will be of a personal nature, although I will try to reflect the point of view of those whom I consulted. It is the intention of CAUT to give an official response to the Science Council Report in the not too distant future.

First of all, I would like to agree with Dr. Bourns that one of the major problems facing us at the moment is the lack of appreciation by some of the provinces of the significance of research and development in the Canadian community. All three of the federal parties represented in the House of Commons are committed to a significant increase in the amount of research and development in this country. Prime Minister Trudeau, in the dying days of the recent election campaign, reiterated the explicit Liberal party promise to increase the level of R&D to 1.5 per cent of the GNP. In order to achieve that, or the more ambitious proposals of the Conservatives and the New Democratic Party, it is clear that we must not only maintain, but increase the number of scientific researchers in this country.

The problem we face is that in many provinces the provincial governments will continue, either explicitly or implicitly, to use

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Linda K. Moffatt, Room at the Bottom: Job Mobility Opportunities for Ontario Academics in the Mid-Seventies, Report to the Ontario Ministry of Colleges and Universities, Queen's Park, Toronto, 1980.

student-driven formulas to fund the universities. As a result, when enrolments decrease in the 1980s, these provinces will be committed to a policy of eroding the universities at exactly the moment at which a federal government suggests we will need a greater scientific effort in R&D. It is clear that the dimensions of this problem will differ from province to province. I would point out, for example, that Ontario, Manitoba, and the Maritime provinces have been remarkably reluctant to recognize the significance of research and development for the future of their provinces and of the country. On the other hand, the province of Alberta, for example, is becoming more and more understanding of the significance both for itself and for Canada of investments in R&D.

Thus when we make generalizations about policy in this country we have to recognize that there are differences in the responses of provincial governments. It is clear that we cannot meet the R&D goals we seem to have set ourselves, unless we produce enough scientists in our universities and unless we maintain the university component of scientific research. Both of these are absolutely essential to the science policy to which Canada is committed by all three of its political parties and by its more enlightened provincial governments. I agree with Dr. Bourns' view that it is essential that there be methods of coordinating the efforts of the federal government with those provincial governments prepared to recognize our priorities. It seems to me very likely that most provinces will pattern themselves after Alberta, and substantially strengthen their provincial research councils. However, it is very important that the provincial research councils and the federal ones should not, in fact, be competing. Rather they should be coordinating research in this country, and I would hope that this matter could be addressed in the near future.

I would like to endorse the point made by Mr. Ogaranko on behalf of the Council of Ministers of Education, namely, that whatever steps are taken, we must avoid freezing the research establishment of this country in its present pattern. It is quite obvious that there is

going to be a shift in resources for research and development to Alberta and British Columbia. Any policy adopted by Ottawa, or by Ottawa in concert with any of the provinces, to try to prevent this from happening would seem to be remarkably shortsighted and foolish. We need to build on our strengths in all parts of the country, not just in central Canada.

I would disagree with Dr. Julien on what might happen if we cut back in scientific university research. He suggested that people would then switch to scientific jobs in industry. It is difficult for me to understand how they could do that if the universities are less and less able to produce scientists to work either in universities or in industry. This inability will occur if we continue to maintain student-driven formulas for university financing, and if we run down the establishment of the universities. I do not believe for a moment that a 20 per cent cut in the faculty will result in a marvellous new thrust of morale and development in the universities. On the contrary, I think that the morale in universities at the moment clearly indicates that the attitude taken by governments like Ontario and Manitoba has produced a deep malaise amongst the faculty. It has also created a desire on the part of many of the best young students, to leave their research areas for something else. It has, in fact, convinced students not to go into scientific and engineering research, either in the private sector or in the universities, but, rather, to become lawyers, chartered accountants, or business managers.

I do agree with Dr. Bourns on one other point: that there is an anecdotal view within the scientific community that age results in the decline of scientific productivity. Not only does his own example indicate this is not true, but some interesting research by Stephen Cole* shows that in the United States there is not very much support

* Stephen Cole (State University of New York at Stony Brook), "Age and Scientific Performance," American Journal of Sociology, Vol. 84, No. 4, pp. 958-977, 1979.

for that particular assumption.

Regarding specific points in the Science Council report that concern CAUT, we agree with the decisions taken by NSERC and by the recommendations of the Science Council concerning the creation of Research Associateships, but I do think that there is a difference in point of view between NSERC and the Science Council. NSERC, it seems to me from Dr. Julien's remarks, is talking about the Associateships as fellowships in the sense that we have always known them, that is, money made available to somebody for a fixed period of time and not likely to be renewed for a very long period of time. After the fellowship has ceased, the person would either go into the university establishment or into something else. They would be something like the KILLAM Fellowships and other fellowships that exist in the universities. The Science Council, however, seems to regard these people as faculty-in-waiting. They would be maintained on these fellowships for a very long time. If that should be the decision made by NSERC, or by the other granting councils, it would seem to be prudent on their part to discuss with the CAUT what their contractual positions actually are.

Some interesting problems are associated with faculty-in-waiting if they are there for ten, fifteen or twenty years. Do they get tenure in some sense? Are they on one-year renewable contracts? Do they get the same benefits as other faculty members? What role does the university department have in choosing them in the first place, or are they chosen in some sense by the federal government? Now all these are not insurmountable problems, and we would not put them up as road blocks, but we would suggest that the way to ensure that these programs will work is to discuss realistically these kinds of dilemmas before one launches into a program.

This also applies to the notion of regrouping graduate programs. I agree with Dr. Bourns that there are problems about the creation of centres of excellence. Most faculty members, it seems, are in favour of merit pay in university, because they think that they will get it;

so all universities are in favour of centres of excellence, as they are sure that they are one of them. I am sure that Dr. Bourns thinks that McMaster is one. I have heard other views in Toronto, and it does colour one's views somewhat when the money actually materializes, or does not, as the case may be. But, aside from that, it seems that attempts to concentrate graduate programs should also be preceded by a discussion about the contractual positions of the people concerned. Are the universities contracting out to a new entity? Are they sharing contracts between themselves? What are they doing? If faculties know what the situation is, they are much more likely to be enthusiastic participants than if they have gnawing doubts about receiving new contracts two or three or however many years down the line.

CAUT has supported the proposal concerning pensions for 25 years. I am delighted to hear that the AUCC is now in favour of portable pension schemes in Canada. Would that it had been favourable in the 1960s. I would suggest that the province of Alberta has, once again, shown us what to do. In terms of university pensions, it has created a system that is admirable, portable not only inside Alberta but outside it as well. In my view, it is one of the best arrangements that any province has made. Whether university presidents are serious about pension portability will be demonstrated by the discussions proceeding at the moment in Ontario between the Council of Ontario Universities and our provincial affiliate in Ontario, the Ontario Council of University Faculty Associations. If they can agree on a mechanism for pension portability, I suspect that it can in fact be translated into a general Canadian plan in the not too distant future. We will wait and see what the response of the university presidents in Ontario is on that point.

On Recommendation 1, I, like Dr. Bourns, feel that CAUT should collaborate with the AUCC in that kind of study. I know that it is a favourite trick to avoid doing things by suggesting that there are bigger things that one can do and therefore one doesn't have to do the

things that one is asked to do. I think that CAUT and AUCC should, in fact, sit down in the near future and discuss what would be useful in carrying out Recommendation 1. But I also think, and I am now speaking for myself, that CAUT and AUCC should be discussing the possibility of creating a commission to look at what, in very precise terms, is happening to universities across the country as a consequence of funding that is consistently less than the rate of inflation. We now have much talk, much incidental information about this and that university. It might be useful to bring it together in a general compendium through such a study; to see exactly what has happened over the last five years, and what is likely to happen if the rates of financing by the provincial and federal governments continue as they are. Thank you very much.

REMARKS by Dr. René Simard, President, Medical Research Council

My comments will be relatively brief. I have no difficulty in agreeing with most of the recommendations in the Report of the Science Council. I also feel that I should add my congratulations to those preceding me. I think that the writers of the Report have covered the situation quite well. Nevertheless, one is tempted to make some comments. I have four comments.

The first is that without any hesitation I find the Report to be somewhat conservative in its analysis. It is evident that when one wants to focus on objectives, it is important to make a complete analysis of the situation and to be clear as to where one wishes to go. But it is equally important, when making this analysis of the actual situation, to try to identify the causes that placed university research in jeopardy. It was probably not the purpose of the Report to address itself to causes. The purpose was to demonstrate that university research is in jeopardy, and to propose recommendations in relation to this. However, I feel that to avoid repeating past errors it would, perhaps, have been important to consider the factors leading to this situation, and I regret not seeing this aspect treated in the Report of the Science Council.

A second comment. The Report makes no mention of the "partnership", and here I am using the expression of Dr. Bourns, which must exist between the different levels of government in order to carry out the financing of university research. You will understand that this partnership is particularly complicated in the field of bio-medical research and involves problems of coordination quite difficult to handle. I am speaking about the problems of coordination among the

activities of the federal government, for within the federal government there are two organizations that can support health research (the Medical Research Council and the Department of National Health and Welfare). And I am speaking about the same problem within provincial governments, for even within the provincial governments there are two ministries in every province, which are often in a state of confrontation, the one with the other. Thus, in the field of the health sciences, the Ministry of Education is responsible for the salary support for faculty and other indirect costs for research carried out in a university. On the other hand, the Ministry of Health or the Ministry of Social Affairs oversees or, in any case, partially finances, by indirect costs or otherwise, research carried out in hospitals. Ten years ago, about 45 per cent of the research in the health sciences was done in hospitals, while today this proportion is reaching 55 to 60 per cent. There is therefore a movement, a decentralization if you like, of research in the field of the health sciences, from university campuses to university-hospital centres. I believe that partnership is extremely important in this area, and we can see why discussions involving the different levels of government can become quite complex.

I would be remiss if I did not refer to another actor on the stage, one that is particularly important in the field of bio-medical research, and that is the existence of philanthropic societies which finance research related to particular diseases. For example, ten years ago, the Medical Research Council funded approximately 70 per cent of all research in the field of the health sciences. Within the span of only ten years, this proportion has been lowered from 70 per cent to 40 per cent. This means that the Medical Research Council, in the field of the health sciences, must now take into account, along with a number of levels of government, many philanthropic societies. I have counted as many as 125 of these, and the problem of coordination is often quite difficult.

My third comment is in support of that made by Dr. André Fortier. If there is a missing body in the Science Council Report, it is the Social Sciences and Humanities Research Council. I believe that in a well organized society, research must span a continuum; and, personally, I feel ill at ease if one does not support or if one forgets or leaves aside research in the field of the social sciences. We frequently hear about requests to the Science Council to involve itself in fields that would appear to be of high priority for Canadian society, for example gerontology. But when one begins to investigate what should be done in the way of research in this field one finds out that the problems are possibly more socio-economic than bio-medical. Consequently, we should be able, at any time, to have a research project transformed from its laboratory implications to its eventual socio-economic implications.

One of the major recommendations of the Report is the need for granting councils to provide salary support for researchers in universities. Because MRC has much experience in doing this, I would like, fourthly, to discuss this question, and to give an example of how federal support has been eroded in recent years.

In Table 1 we compare the situation in 1973-74 with that five years later, in 1978-79. In the column entitled "Establishment" we have the kind of salary support, typified by MRC Scholarships, that enables deans of medical schools and hea[illegible] science faculties to attract bright young investigators and cover their salaries for up to five years. Under "Career Support" we have the support typified by MRC Career Investigatorships (formerly called Associateships). In this program, salary support is provided for senior investigators, such as those who had terminated their scholarships and were ready and qualified to enter upon a career of medical research in a university. MRC's program was abandoned two years ago, insofar as new appointments are concerned. However, an example of partnership is evident here in

TABLE 1

EXTRA-MURAL SALARY SUPPORT IN 1973-74 AND 1978-79

SOURCE OF SALARY	OBJECTIVES OF SALARY SUPPORT								TOTAL	
	ESTABLISHMENT (SCHOLARSHIPS)		CAREER SUPPORT[1]		REGIONAL DEVELOPMENT		SUBJECT DEVELOPMENT			
	1973-74	1978-79	1973-74	1978-79	1973-74	1978-79	1973-74	1978-79	1973-74	1978-79
FEDERAL										
MEDICAL RESEARCH COUNCIL	143	119	104	93	14	28		3	261	243
HEALTH AND WELFARE		31	33	14					33	45
PROVINCIAL										
QUÉBEC, CRSQ[2]		50								50
ONTARIO, OCTRF[3]			2	11					2	11
OMHF[4]	6	8	4	6					10	14
OTHER										
ARTHRITIS SOCIETY		3	18	22					18	25
B.C. LUNG ASSOCIATION				1						1
TUBERCULOSIS AND RESPIRATORY DISEASE FNDN.	5								5	
CANADIAN HEART FOUNDATION	13	16							13	16
ONTARIO HEART FOUNDATION			1	4					1	4
MULTIPLE SCLEROSIS SOCIETY		2								2
NATIONAL CANCER INSTITUTE	5	21	8	10					13	31
FEDERAL TOTAL	143	150	137	107	14	28		3	294	288
PROVINCIAL TOTAL	6	58	6	17					12	75
OTHERS TOTALLED	23	42	27	37	—	—		—	50	79
GRAND TOTAL	172	250	170	161	14	28		3	356	442

1. INCLUDES CAREER INVESTIGATORSHIPS (ASSOCIATESHIPS), SALARIES FOR MEMBERS OF MRC GROUPS, AND RESEARCH PROFESSORSHIPS.
2. CONSEIL DE LA RECHERCHE EN SANTÉ DU QUÉBEC
3. ONTARIO CANCER TREATMENT AND RESEARCH FOUNDATION
4. ONTARIO MENTAL HEALTH FOUNDATION.

that provincial and philanthropic organizations have, to a considerable extent, filled the gap created by the decrease in federal support.

The increasing significance of provincial support is illustrated by the action taken by le Conseil de la recherche en santé du Québec. When le Conseil realized that, because of its limited funds, MRC was unable to provide adequate support of this type, it established a program of fifty chercheurs-boursiers or scholarships.

In order to study the whole question of research manpower, MRC called together a committee of the Deans of Medicine. They were then provided with various choices for action: the re-activation of the Career Investigatorships program, an extension of the Scholarships program, a program of 5-year Research Professorships, a program of 3-year Research Scientists and, finally, any other type of salary support that was felt to be important in enabling the health sciences faculties to attract investigators who would be engaged in full-time research. The general comment of the deans was that if a new program could provide for the support of, say, 125 investigators, then MRC should undertake it, either by reopening the Career Investigatorships programs or embarking on one of the programs suggested. However, they said that if we were limited through financial constraint to a program of only 50 investigators, this would be worthless; not enough positions would be provided, and the program would lack the visibility that is needed at the present time.

The problem of research manpower is a complex one. I would like to have seen the Science Council Report make a strong recommendation to the federal government to make a much greater commitment to the financing of university research. Unless really adequate funds are provided to the three councils, the painful lobbying and discussions that have been going on year after year will have to continue, and no council will have enough resources to take on a program of the necessary magnitude.

You will note that I did not address myself to the threat of declining enrolment in Health Sciences faculties, since in the medical schools, there is no foreseeable reduction of enrolment in the years to come. However, as mentioned in the Report, that will not immunize these faculties against the indirect effect, because they would have to share any reduction of resources with other faculties.

DISCUSSION AMONG THE PANELISTS

Dr. Bourns began the discussion by saying that he, like Dr. Savage, was less optimistic than Dr. Julien about the possibility of a reduction in university faculty leading to a strengthening of university research. He then went on to illustrate the nature of his concerns by giving two examples drawn from his own university. Although the enrolment in the Faculty of Engineering at McMaster has nearly doubled in five years, the number of faculty has increased by far less than that. As a result, the teaching demands on a faculty that is well known for its dedication to research are placing limits on their research productivity. One evidence of this was in what Dr. Bourns considered to be a disappointingly low number of applications for NSERC Strategic Grants. He did not believe that the universities of Canada, particularly in those provinces referred to by Dr. Savage, would be able to respond to the initiatives of NSERC unless the provinces address the serious problem of financial support for the infrastructure of research.

Dr. Bourns then illustrated the need for a federal-provincial partnership in the support of university research by referring to the subject of major equipment and major installations. Last year the faculty was quite successful in gaining a number of NSERC awards of this type. However, because of the fact that NSERC was itself short of money, these awards were conditional upon the university advancing certain sums of money as well. Dr. Bourns said that it was so difficult to squeeze this out of the available funds that he was close to the point of saying that they could not accept the NSERC money. It is quite clear, he said, that the new initiatives taken by the federal government in supporting university research will lead nowhere unless

the federal government and the provinces, together, address the specific issues of funding.

Dr. Julien responded by saying that he was pleased to have provoked some discussion, even though there was disagreement on one point. He felt that we were all aiming at the same objective, namely an overall increase in the level of research and development in our universities. He was concerned, however, that we should not over-emphasize the question of numbers. Of equal, or possibly greater, importance is the environment for research, environment provided by the federal government through NSERC initiatives, by the universities themselves, and by the provincial funding mechanisms.

Mr. André Fortier also addressed the question of partnership, raised by Dr. Bourns, using as an example the funding of university libraries. He pointed out that the support of research by SSHRC is handicapped because universities are cutting back on the funds available for library purchases, funds which come from the general operating budgets of the universities, and are provided by the provinces. If only there were a concensus on the part of the Council of Ministers of Education and the federal government as to their relative roles, then progress could be made. So far, he said, there appeared to be no concensus as to which level of government should do what.

Dr. Savage then referred to the program of exchanges with China as another example of federal-provincial politics interfering with the development of effective programs.

Regarding the matter of provincial support for research, Mr. Ogaranko pointed out that the Council of Ministers of Education (CMEC) now has a committee, called the Canadian Committee on Financing University Research, which has in its membership provincial, federal and university representatives, and that this committee is examining both the methods and the effectiveness of provincial support for research. The formation of the committee was indicative of the fairly

new and much more significant interest in research and development being taken by the provinces. He congratulated NSERC on its initiative in meeting with provincial officials and seeking their involvement in NSERC programs, and he noted that MRC has also done this. Mr. Ogaranko pointed out that it is difficult for ten different provinces to take a position on research and development in relation to the federal government, but that he was quite hopeful in this regard. The provinces are now beginning to articulate the manner in which they would like to support research for the achievement of provincial goals.

Dr. Claude Fortier responded to an earlier remark by Dr. Simard, who had expressed a feeling that the Report had failed to deal with the causes underlining the present crisis in the universities, by pointing out that the Statement of the Chairman of the Science Council for 1978-79* was specifically directed at that very problem. The lack of partnership and cooperation between the federal and provincial levels of government in relation to the support of research and the hiring of faculty was clearly underlined. Although in the Report, this may not have been enunciated as clearly as Dr. Simard might have wished, it underlines the whole of the Report. Partnership among the universities themselves, the federal granting agencies, the provincial governments and the industrial sector is clearly called for.

He then pointed out that, contrary to the interpretation of some speakers, the Report had not predicted that a 20 per cent decrease in the number of young people of university age would be reflected in the same decrease in university faculty. Also, the Report emphasized the need for financing universities on a basis other than student enrolment. The Report also placed emphasis on the participation rate and on the importance of maintaining the quality of the university environment to ensure that this rate should not decrease. Nevertheless, the Report

* Universities and Academic Research at the Crossroads, Statement of the Chairman, Science Council of Canada, Annual Report No. 13, Supply and Services Canada, Ottawa, 1979, p. 21.

emphasized not the maintenance of numbers but rather the maintenance and improvement of quality. It was not a matter of extending the status quo but, stimulated by the demographic challenge, of introducing imaginative, innovative programs that would contribute to the advancement of the quality of research in this country. This concept led to the emphasis, for example, on the criteria which the Science Council felt should be adopted in the selection of the proposed Research Associateships (now referred to by NSERC as University Research Fellowships).

The chairman of the seminar, Dr. L'Abbé, noted that the need for partnership between the provinces and the federal government had been emphasized by most members of the panel, and he agreed that the report did not place as much emphasis on this as it probably should have. It did not, for example, propose any mechanisms to deal with the problem. Dr. L'Abbé felt that it was now particularly appropriate to consider definite proposals and mechanisms.

The discussion among the members of the panel having been terminated, Dr. Claude Fortier expressed his appreciation to Mr. André Fortier for his relevant remarks on the important role of the social sciences and humanities in our society.

GENERAL DISCUSSION

To open the general discussion, Dr. L'Abbé invited the Honourable Douglas McArthur to comment. Mr. McArthur opened his remarks by saying that he welcomed the opportunity to comment on a subject he felt to be very important. Although there was general agreement that university research was an important part of our overall research effort, there was, of course, a variation in attitudes and approaches toward it in the different parts of the country. Even if there should be differences in opinion about the assumptions contained in the Science Council Report, he felt that its message should be taken very seriously. He considered it to be an excellent statement of what could happen. He felt that the jeopardy in which university research has been placed arises through the confluence of two phenomena. The first is that after a period of rapid growth, the university sector, at least in terms of teaching services, has undergone a period of no growth, and that the need for teaching services will very likely decline sharply after 1982. The second phenomenon is that there appears to be a decline in the priority assigned to research by certain governments and industries, not only in the natural and physical sciences, but also in the very important human and social sciences.

With regard to the first phenomenon, he pointed out that a realistic examination shows that, over the last 20 years at least, the whole university system has been built on the expectation of growth in student numbers, and the various arrangements made with government to provide financing have been based on this assumption. This has given rise to student-driven formulas. There is no doubt that these formulas have been predominant in determining the funding for universities, and that the universities themselves were, to a large extent, willing

parties to this approach to financing. We also see, if we look back, that in many respects, research and other activities of that nature rode "piggyback" on the assumption that the provinces had a responsibility for education. There was no attempt to define provincial responsibility explicitly.

It is becoming clear that student-driven formulas, good for research when student numbers were growing, are placing university research in jeopardy now that student numbers are likely to shrink. This raised the subject of participation rates which, after being stabilized in the mid-1970s, now appear to be declining. Mr. McArthur noted that the subject of participation rate had not been addressed by the panel, but that it is highly relevant to the future of the universities. If there should be a substantial decline in participation rate, we are likely to face serious problems in Canada, not just in the area of research, but with the supply of trained people of all types. Mr. McArthur felt that the question of how to improve participation rates should be addressed by the federal government, the provincial governments, and the universities, because it is not receiving the attention that it should have.

With regard to the second phenomenon, Mr. McArthur felt that the problem of low priority for research resided in the type of branch-plant economy developing in this country. He also felt that the growing inclination of governments to reduce activities in the public sector went hand-in-hand with the decline in research. He lamented the decline in public spending on research which resulted, in his view, from our governments being pressured to reduce public expenditures generally by "our intellectual and business elite." Mr. McArthur then went on to discuss the importance of planning in the university sector. He did not feel that the universities were taking planning very seriously. University planning should, he felt, include taking positions on structural and other kinds of adjustments. Universities

should be prepared to discuss these matters with government and not simply confine their attention to funding.

He noted that there has been considerable discussion of the need to increase provincial support for research. The Report itself advocated provincial research chairs, as well as other kinds of special support. He felt that there was good potentiality here, and noted that several provinces are engaging to a greater extent in the support of university research. Nevertheless, he felt that one should not be too optimistic about the possibility of a major increase in the amount of provincial support. Publicly-supported research is generally of such a nature that cost-benefit analyses of expenditures made at smaller levels of government are not likely to withstand scrutiny as well as those made by a larger level of government, because the spin-off from publicly supported research cannot be contained within provincial boundaries. It is no accident that, historically, university research tends to be a federal responsibility. For this reason he felt that provincial support for university research generally will face constraints. It can be expected that specific thrusts, related to provincially-based development opportunities, will receive the bulk of increasing provincial support.

Dr. Jean-Guy Paquet, Rector of Université Laval, then spoke. Referring to the anecdote about Alfred P. Sloan, related by Dr. Julien, he noted that if Mr. Sloan had been the chairman of a university council or of an academic senate he would never have had to postpone a meeting because of lack of disagreement. Dr. Paquet was a member of the Standing Committee on Research of the Science Council, which had overseen the preparation of the Report, but he explained that he preferred on this occasion to speak, not as a member of that committee, but rather as the rector of a university.

As was mentioned by Dr. Bourns and Dr. Savage, the universities are finding it more and more difficult to carry on research because the funds provided to them keep on decreasing; education is no longer a

high priority. The problem we have to face, he said, is that the method of financing universities is not adequate for favouring the development of research. Over the period of a decade, the ratio of professors to students in the universities has gone from 1 to 8 to 1 to 9, 1 to 10, 1 to 12, 1 to 13, and we are told that this ratio can be increased because in the universities we have economies of scale. But, Dr. Paquet pointed out, if the universities are stretched to the limit it is not possible to have economies of scale without sacrificing quality.

If one wants to develop quality, the financing formulas will have to be revised, making greater provision for research and for a decrease in the number of students per professor. One must also arrange for young researchers to enter careers in research. Programs of Research Associates, being put into effect by the two councils, should play an active role. But he felt that, unless changes were made, it would be difficult indeed for Canadian universities, particularly those in Québec, to participate in the programs of the Councils. Although excellent, they tend to discourage the recruitment of young research associates, because one cannot offer them the prospect of continuing careers in research.

Dr. Paquet then raised a second point - the payment of the indirect costs of research. He pointed out that the provincial governments continue to accuse the federal government and the granting councils of orienting research in the provinces by supporting only one part of it. He asked whether the granting councils had given serious consideration to paying the indirect as well as the direct costs of research, and he also expressed the hope that Mr. Ogaranko and Mr. McArthur might have some remarks about this. He would like to put an end to the prolonged and fruitless discussions which had gone on for years.

The subject of the payment of indirect costs of research was then taken up by Dr. René Simard, who said that insofar as the granting

councils are concerned, they would be quite happy to provide indirect costs for research if they were given adequate funds to do so. This is already done in the United States. He felt, however, that such a program would tend to make the rich richer and the poor poorer and would have to be compensated by programs designed to overcome this difficulty.

To clarify the issue, Dr. L'Abbé suggested that in talking of indirect costs, one would not include academic salaries because this would be certain to give rise to major problems. The subject of indirect costs was then taken up by Dr. Bourns, who expressed his concern lest the provision of indirect costs by the federal government result in a corresponding decrease of provincial funds, or if, as the result of paying indirect costs, the granting agencies had to cut back on their support for the direct costs.

Dr. Savage shared Dr. Bourns' concern, and noted that with the recent change in the way in which federal funds are turned over to the provinces for post-secondary education, the provinces are no longer obliged to spend that money on post-secondary education. It was also quite evident, he said, that some provinces, including Manitoba and Ontario, certainly were not spending the money on universities. Dr. Savage made a very strong point that if one is to discuss the question of federal-provincial financing in a serious way and throw open the door of indirect costs, we must bear in mind the very significant sums involved in the established programmes. Unless this is borne in mind, we are apt to lose track of many millions of dollars which might have gone toward the support of universities, while picking up a much smaller sum in the form of indirect costs of research.

Mr. Ogaranko did not hold out much hope for a quick resolution of the problem. He noted, however, that the Council of Ministers of Education has sponsored, through the Canadian Committee on the Financing of University Research, a report on the relationship between the direct and indirect costs of university research. The Council of

Ministers has not yet formally considered the report. However, in the province of Alberta, the government is considering the issue in relation to research contracted by the various provincial departments to the universities in Alberta.

Dr. Julien mentioned that, in the second round of discussions between NSERC and the provinces, the subject of sharing research costs had been raised. He also said that in its Five-Year Plan, NSERC had identified certain costs which had formerly been borne by the universities and/or the provinces. In particular, he said, NSERC intends to increase its contribution for the maintenance and operation of the research equipment it provides. Consultation would have to take place in this whole area to avoid the possiblity that the provinces and universities might withdraw support, thereby leading to a net loss for university research.

Dr. René Levesque then enlarged on the question of financing the infrastructure for research, in particular, the specialized manpower in the form of technicians and the like, which must accompany the complex instrumentation in the field of the natural sciences and engineering. Similar problems occur in the humanities and social sciences, where centres of documentation play a role similar to the instrumentation of the sciences. Provision must be made, he felt, for the support of specialized manpower on a basis more substantial than year-to-year.

Dean Leffek pointed out that if we are to increase Canadian R&D in line with the target set by the government, we will have to counter the shrinking cohort by methods designed to increase the participation rate. The postgraduate fellowships and summer studentships of NSERC are serving as incentives in this regard and are likely to stimulate high school students to contemplate careers in science or engineering. As for whether there will be jobs for young scientists and engineers turned out in response to the government objective, Dean Leffek said that the government would have to shoulder that responsibility.

Regarding the quality of teaching and research, Dean Leffek felt that the former was likely to improve with age, while the latter might decrease in quantity but not in quality.

In a different vein, he wished to draw to the attention of the participants, and particularly of those who were members of the press, the statement about basic research which appears on page 38 of the Report (page 42 in the French version), which he considered to be one of the best that he had ever read.

As one of the methods that could be used by government to increase the participation rate, he advocated a tax shelter system for parents who might wish to put aside money for the future education of their children.

Dr. L'Abbé then asked Dean Leffek about his views on Recommendation 5.* Dean Leffek responded that in the Atlantic provinces there was a long history of trying to cooperate, and he referred to the Atlantic Provinces Inter-University Committee on the Sciences (APICS). Most of the opposition to effective cooperation, he said, came from university presidents, and from the theory that cooperation is inversely proportional to autonomy. The smaller Maritime universities feel very vulnerable, and are concerned about the possibility of having their research effort removed. While we should try to strengthen those areas of research which are strong, we must also maintain an appropriate level of research in the smaller universities because they have a contribution to make, and indeed, have produced many scientific leaders. If we want to stimulate an interest in science, it is necessary to have science right where students are, and not at some remote place like Halifax or Toronto.

One of the difficulties in trying to achieve inter-university cooperation, he said, was that the Maritime Provinces Higher Education

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* See page 81.

Commission, which is the agency that makes recommendations for the support of universities to the governments of the three Maritime provinces, has consistently refused to recommend support for an inter-university group. It only recommends that money be provided to individual universities, so that the universities then have to put money back into the university group. It is next to impossible to get all universities to provide sufficient money for this kind of cooperative effort. He expressed the hope that the publication of the Science Council Report might help to encourge inter-university cooperation.

The subject of participation rates was raised again by Mr. Ogaranko, who pointed out that the labour market can have a very important bearing on this. One reason that the participation rate in Alberta is relatively low is undoubtedly the excellent alternatives available in the private sector. In view of these, there is little incentive for the undergradute student to remain in university and take up graduate work for a period of four or five years and then face an uncertain future as a scientist. Most affected by this in Alberta, he said, is the engineering group. The oil companies enticing engineers away from the university are relatively new, and so the prospects for advancement in these companies are more or less unlimited. An undergraduate in engineering has prospects that far exceed those offered by the university. The University of Calgary, in particular, is experiencing difficulty, not only in retaining their undergraduates as graduates, but in losing some of their better researchers, who are being enticed into the private sector. Mr. Ogaranko said that the same thing is likely to happen on the East Coast, if the oil deposits there turn out to be as good as predicted.

Dr. John Trent then took the floor. He said that he considered the Report an excellent one and that he endorsed many of the recommendations. However, he shared Dr. Bourns' concerns about the possibility of implementing some of the recommendations that were addressed

to the universities; so much so that he felt the next area of study should be the implementation of such recommendations.

Dr. Trent then went on to discuss two aspects of the Report that caused him some concern. The first was that it tended to create the impression in the minds of the public and our legislators that the problems being discussed are not going to happen until they are suddenly upon us in 1982. He considered it important to recall that the enrolment problem has been with us for at least six years, and that the universities have been suffering accordingly in their financing and in other ways. It was perhaps a useful thing a few years ago to cut out some of the fat in the universities, and maybe to even draw a little blood, but we are now down to the bone, and the marrow is beginning to show. It is important to tell the public, he said, that not much more cutting back can be done.

The second point that concerned him was in connection with participation rates. Although the Report does point out on page 22 (page 22 in the French version also) how crucial it is to maintain and, if possible, to increase the participation rate, he regretted that the Report did not approach the question from the point of view of making sure that every child with the potential gets the opportunity to go to university, and whether or not we have national, provincial or regional policies for developing jobs that demand higher levels of skills and education. That these factors were not considered in the Report raised what Dr. Trent considered to be the traditional Canadian battle between the advocates of a mass education on the one hand or of an elite approach to education on the other. He agreed that an elite approach was necessary in the case of research, where the emphasis is on quality, but he also felt that we have a wider responsibility in relation to university participation as a whole. Dr. Trent then went on to list three arguments in favour of trying to bring about an increase in participation in the next few years. The first was that in response to the government's plan for increased research and develop-

ment, there will be a greatly increased demand for trained manpower. The second was that the greater the number of people we have in the universities, the greater will be the likelihood that we will be educating the best and the brightest. Thirdly, a tremendous investment had already been made in plant and faculty in the universities across the country, and it would be an economic loss if we were to let it deteriorate. These three arguments, he felt, when put together, make a combined moral and socio-economic plea for increased participation.

Dr. Trent felt that there should be two kinds of response to this plea. The first would be that even those who are concerned about the quality of research should be equally concerned with participation rates, because if they decline this will have a demoralizing effect throughout the university community. Secondly, he said that it is going to be a question of political will and political leadership, whether or not governments are going to increase the participation rate.

Mr. McArthur responded to Dr. Trent's last statement. He said that he interpreted it as meaning that Dr. Trent felt that the important problem of participation rates was somebody else's problem, not the universities'. He said he was not prepared to accept that view, the issue must be approached cooperatively. One of the problems, he felt, is that the universities have tended to lose their identification with society. Secondly, he wanted to come to the defence of realism and of the Report by pointing out that the Report concerns itself not with the problem that has been with us for the last several years, but one that could become much more serious. For some time, he said, the high schools did not appreciate what was happening in the elementary schools, and it came as a shock when the "shrinking cohort" began to affect the high schools. It is therefore important to look ahead and prepare for the compound effect that a shrinking cohort and a reduced participation rate could have on university registration.

Dr. Willes said that he assumed that the projections in the Report had come from the MOSST manpower model. If this were the case, and if the model were a good one, it should be possible to perturb the model by varying participation rates to see what would happen.* While money appeared to be readily available to carry out studies on economic implications of research, it is very difficult to get support for manpower models involving demographic factors, and he felt that this should be rectified.

Dr. Willes then addressed the question of the effect of our branch plant economy on R&D, first raised by Mr. McArthur. It was his understanding, he said, that Japan, which has achieved one of the most successful R&D policies in the world, has done it almost completely with a branch plant economy. He felt it was the responsibility of the politicians to persuade industry to do research and development in the country where they were located, whether it was a branch plant or not.

Dr. Willes then stated that, in his opinion, the main function of university research is teaching, and that research in universities is performed to train researchers. He said that if one were only interested in doing research, and in doing it efficiently, it should be done outside the university, in an industrial setting or in a research institute.

Dr. Low said that he had found the Report quite helpful in providing an understanding of the issues, and that the plans of the three councils were, in many respects, responding to the questions raised in the Report. The federal government does have a goal of 1.5 per cent of GNP as a target for R&D expenditures, and this is bound to have a very strong effect on university research. It is well understood in the government, he said, that qualified people are at the base

* The quantitative projections referred to in the Report are those made by the Projections Section of the Education, Science and Culture Division of Statistics Canada, and reproduced in Figures II.1 and II.2. No use was made of the MOSST manpower model. - Ed.

of any attempt to achieve a higher research target, and MOSST has estimated that, if the target is to be reached by 1985, we are going to have a shortfall, in the applied sciences alone, of about 3000 to 4000 people. In coming to grips with the problem, the government has before it the Five-Year Plans of the three councils, and these are now up for discussion with the new government. The government will also be made aware of issues that have been raised in the Science Council's Report.

Dr. Low then made reference to the Canadian Committee on Financing University Research, which, he said, was about the only formal vehicle available for federal-provincial discussions on university research. This committee has already published two reports.* He said that the CCFUR was still feeling its way to some extent, but that it is now reviewing its role, and he expected to see it playing an important role in the future.

Dr. Low said that if the federal and provincial governments are going to share responsibility for university research, then attempts should be made to reach an understanding of the division of responsibility. He referred to Mr. McArthur's remark that publicly supported research has, in most cases, implications that go beyond provincial boundaries, and is therefore best funded at the federal level. However, in other cases university research may be directed to regional or provincial concerns. Also, a certain amount of research is directly related to teaching. Does it then make sense for provincial governments to think of supporting these kinds of research? Dr. Low made it clear that he was not advocating any particular division of responsibility at this stage. Resolution of the problem was, however, a necessary and important step in implementing the Report of the Science Council.

* (a) Direct Funding of University Research by the Federal and Provincial Governments;
(b) Reports of the Pilot Study on the Costs of University Research.

Dr. Bourns responded to the question raised by Dr. Low. He had, he said, once written a paper for the Ontario Economic Council, which was specifically concerned with the question of the appropriate division of responsibility for the support of university research between the two levels of government. Not only, as pointed out by Dr. Low, is there a teaching role associated with the carrying out of university research, but there is no clear distinction between teaching and research. Arbitrary, pragmatic approaches could, he felt, be worked out, but could this be done between the ten provinces on the one hand and the federal government on the other? It would be more realistic to go to the other extreme and consider bilateral arrangements between the federal government and individual provinces.

Mr. McArthur said that although the federal government was not, in his opinion, accepting enough responsibility for research, it was clear also that the provinces were going to make a greater effort in this regard, particularly with respect to research in line with provincial priorities and provincial economic and social development patterns. As for the bilateral arrangements suggested by Dr. Bourns, Mr. McArthur felt that although it may not be the best way to proceed in an ideal world, it might be the practical way to proceed in the world in which we live. He pointed out, however, that bilateral arrangements could bring about substantial disruption in the present arrangements for the sharing of direct and indirect costs of university research.

Dr. L'Abbé observed that the paradox of the Canadian situation is that, while basic research is likely to transcend provincial boundaries, it is, at the same time, likely to be most closely associated with teaching.

Mr. Gilles Provost said that, quite frankly, he was disappointed both by the Report of the Science Council and by much of the discussion during the seminar. Declining enrolment could equally well have beneficial consequences for research; yet the Report had treated one particular aspect of falling enrolment, and even that had not been gone

into in great depth. The only breath of fresh air was provided by Mr. McArthur, who had pointed out the principal contributor to the malaise - our branch plant economy, and the numerous obstacles to industrial research. He regretted that the discussion had focussed on the links between financing of university research and student manpower. According to Mr. Provost, greater consideration should have been given to the lack of employment prospects for graduates as well as possible increases in participation rates, particularly amongst francophones.

Moreover, he added, it is normal that a decrease in teaching load leads to a decrease in university research, particularly as the latter is tied to the pedogogical function. In discussing industrial research, Mr. Provost noted that many government contracts given to the industrial sector are for military production. He concluded by asking whether young Canadians can be encouraged at the prospect of undertaking industrial research in an American branch plant and for the profit of the military-industrial complex.

Dr. Bourns took issue with Mr. Provost's lack of concern for the decline in university research that could accompany decreasing enrolment, and also with his statement, and that of Dr. Willes, that the main reason for carrying on research in the university is the training of manpower. While this is an important function, universities in Canada, the United States, and in most other developed countries, have the principal responsibility for conducting basic research. Furthermore said Mr. Bourns, the enormous concentration of research talent that exists in our universities gives them a unique capacity to address many major problems of national concern. NSERC, through its Strategic Grants program, is encouraging many of our young scientists and engineers to engage in research of direct relevance to national needs. He concluded by expressing the plea that we not go back to the pre-war attitude that teaching is the only reason for university research.

Dr. L'Abbé expressed surprise that, during the discussion on university teaching and research, no one had mentioned the quasi-univer-

sity institutes, such as exist in the United States, Germany, France and England - institutes associated with, but not an integral part of a university. He noted that in the Québec "green paper"* such institutes had been suggested. These would be analogous to the Max Planck Institutes in Germany.

Dr. Vikis-Freibergs said that she wished to reinforce the point made by Dr. Bourns on the role of university research. It would be very serious to limit the role of university research to its association with teaching. University researchers have the responsibility for advancing knowledge. As for transferring this knowledge to industry, she said she knew of brilliant young PhDs in the field of psycho-pharmacology, who had been unable to find employment in this important field in spite of the fact that there are in Canada many large subsidiaries of multinational pharmaceutical manufacturing companies. One method of solving the problem would be to establish institutes for carrying on the necessary research and have them financed by taxing the multinational companies. She said that Mr. McArthur might want to comment on this approach.

Mr. McArthur responded that this certainly was one way of proceeding. On the other hand, the method used in Saskatchewan was to nationalize the industry so that government can decide what research and development work should be done. For example, until the Saskatchewan government entered the field, the potash industry was almost totally foreign-owned and sponsored a minimum of research and development. Now this is changing, he said.

Dr. Julien said that the experience gained by the National Research Council, and continued by the Natural Sciences and Engineering Research Council, had shown that the program of Industrial Postdoctoral Fellowships provided an effective method for encouraging interaction

* Toward a Scientific Research Policy for Québec, Le Ministre d'État au développement culturel, Éditeur officiel, Québec, 1979.

between the universities and industry. The new manpower and grant programs proposed by NSERC will offer a broader range of activities at the university/industry interface. In launching the industrially oriented award programs referred to in its Five-Year Plan, NSERC is, in effect, pushing on the rope. What is missing is pull from industry. There is a need, he felt, for major steps to be taken by other levels of government to establish an overall plan of action for industrial research, consistent with the government's R&D target and policy.

Dr. Julien then said that he wanted to make it clear that NSERC will continue to support excellent university researchers wherever they may be in the Canadian university system. NSERC is aware that the problems faced by the researchers in the francophone universities are different from those of others, and special mechanisms are required. That is why NSERC has decided to continue its program of special aid to the francophone universities. In the same way special mechanisms are required to handle the problems of the small, isolated universities in Canada, to enable them to participate in the national R&D effort.

Dr. Kristjanson then said that he wished to make two points. As a member of the province of Alberta's University Commission during the brief six years of its life, he had the opportunity to observe the attitude relating university funding to the number of students. Even during the time when enrolment was increasing relatively rapidly, the universities were not enthusiastic about this mechanism. But from the government point of view it provided what appeared to be an objective method of distributing money for the universities. He agreed that for many years research tended to be a bootleg endeavour which, to use Mr. McArthur's term, rode piggyback on the provincial support provided on the basis of students. Although it is undoubtedly true that there is an intimate relationship between research and teaching, this does not imply a simple quantitative ratio. This becomes particularly evident when we look at different disciplines. So, just because there may be fewer students in the future, it does not necessarily follow that there

will be less need for university research. On the contrary, he said, the problems of our modern society would suggest that there is an even greater need.

Dr. Kristjanson then raised the subject of critical mass. He said that this was a complex issue; in many instances a large number of small, isolated groups might actually do better research than a smaller number of large ones because they could provide a greater opportunity for diverse thinking and the introduction of new ideas. He was also concerned that in a country as large and dispersed as Canada, to concentrate effort in a few places would make it difficult to students in many centres to have adequate access to graduate work.

Dr. Yves Giroux then raised a question which he felt was quite crucial in its relationship to the objectives being discussed but which had, so far, not been given any consideration. This was the influence that the unionization of university faculty is likely to have on the state of university research and on its development in the foreseeable future. It is quite evident, he said, that in universities where unions are strong, such as at Laval and in most of the Québec universities, the collective agreements tend, as might be expected, to protect the rights of those already employed. They tend also to limit access to the category of professor to a more restricted number of people, because union agreements provide, effectively, for continuing, career-type appointments.

Dr. Giroux observed that several excellent manpower programs were being considered: those proposed in the report of the Science Council, those announced in the Five-Year Plan of NSERC, and those being considered in the province of Québec.*

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* See, for example, the recent Quebec "white paper", A Collective Project: Statement of policy objectives and plan of action for the implementation of a scientific research policy for Québec, Government of Québec, 1980.

There are also a number of excellent programs now in place, e.g., MRC Career Investigatorships, MRC Scholarships, and a similar program of the Conseil de la recherche en santé du Québec. But it will be necessary for the faculty unions to realize that they too, have a role to play. They must be prepared to introduce some flexibility into their system, and contemplate types of employment which, in the interests of research and professionalism, might be other than permanent. He felt that while the public is concerned with the need to avoid interruptions in the career plans of university researchers, it was also concerned that the faculty unions show some flexibilty.

Dr. L'Abbé then invited Dr. Savage to comment on Dr. Giroux's remarks. Doing so, Dr. Savage agreed that the problem was important. He was, he said, somewhat suspicious of the word "flexibility" because it covered such a wide variety of possible arrangements. There will undoubtedly be a substantial increase in the number of appointments of the type of Research Associateships, and there should therefore be discussions between CAUT and NSERC about how these researchers would relate to the regular university faculty, half of whom, across the country, are now involved in certification of one kind or another. He was hopeful, he said, that it would be possible to develop a flexibility that would ensure the healthy development of university research.

CONCLUDING REMARKS by Leo Yaffe

Dr. L'Abbé invited Dr. Leo Yaffe to make some concluding remarks. After congratulating the Science Council and the principal authors of the Report for their perception of the problem and their recommendations for its solution, he drew attention, in a humorous fashion, to the difference between proposing solutions and carrying them out.

Regarding the subject matter of the Report, Dr. Yaffe said that he was disappointed that it had not given any consideration to the problem of the anti-science attitude pervading the continent. This manifests itself in many ways, such as in the popularity of astrology as compared to astronomy, and the tendency of the general public to blame science for such inadequacies of our industrial economy as pollution. He noted that there was also a political aspect to the anti-science movement, as a result of the existence of idealistic anti-science pressure groups.

In view of the general condemnation of multinational corporations that had been evident in the discussion, Dr. Yaffe said he felt that it was necessary to present a more balanced view. He pointed out that Dow Chemical and Xerox Corporation provided two examples where the Canadian subsidiary of a multinational corporation has been given responsibility for particular areas of research that would be applicable to the company as a whole. On the other hand, there is the case of General Electric. Although the Canadian market provides about 5 per cent of world sales, he is not aware of one PhD doing research in science employed by the Canadian General Electric Company.

Referring to the emphasis placed by several speakers on the need for closer federal-provincial collaboration, Dr. Yaffe said that he heartily endorsed this, provided that the "law of conservation of

money" does not apply. He was concerned that, if the federal government were to give additional money to the provinces for the support of university research, the provinces might arrange for the university to receive the same total amount of money as before.

Dr. Yaffe echoed the views expressed by many of the participants regarding the important role of research in the humanities and social sciences, as discussed by Mr. André Fortier. Nevertheless, he was, he said, somewhat distressed when it came to making statistical comparisons. It is not always valid to compare dollars spent on research, particularly when the areas concerned are not only different, but in different stages of development. To illustrate his point, he recalled that 35 or 40 years ago, when physical scientists like himself were doing their graduate work, it was often necessary to do research with no grant money whatsoever. Perhaps, he suggested, if those who complain that they cannot carry on research because they lack money actually did a little scholarly work they might find that research money would begin to flow.

Dr. Yaffe was pleased to see that many of the proposals made in the Report are already being implemented by NSERC, although he suspected that many of them had been suggested by the principal author of the Report several years ago. With regard to the proposed Research Associateships, he said he agreed with Dr. Savage that their implications should be discussed with CAUT. However, they should also be discussed with the universities, to ensure that the rights of these institutions are not ignored while considering faculty members. He also pointed out that NSERC should bear in mind that the options open to an NSERC Research Associate on the termination of his or her award would generally be somewhat more restricted than those open to an MRC Scholar.

Switching to the subject of participation rates, Dr. Yaffe pointed out that most of the discussion on this topic had been concerned with participation at the graduate level. While this is important, it is

also important to increase participation at the undergraduate level. We must be assured that the opportunity to obtain a university education is open to all with the intellectual capacity to benefit therefrom.

Finally, Dr. Yaffe said that great care must be taken to avoid making arbitrary decisions as to what constitutes a critical mass for productive scholarship. It is neither impossible nor, indeed, uncommon to find individuals carrying on very significant research in an environment where research is otherwise non-existent. Some people can actually work better in isolation, and even without graduate students.

As the final speaker of the symposium, Dr. Yaffe then took the opportunity to congratulate its chairman, Dr. L'Abbé, his colleagues in the Science Council, and all of the participants, for having made possible what he considered an excellent discussion on very important issues.

University Research in Jeopardy

A seminar sponsored by the
Science Council of Canada
2 April 1980, in the Board Room
on the 16th Floor at
100 Metcalfe Street, Ottawa.

9:00 a.m.	Registration
9:15 - 9:30	Welcome by the Chairman of Science Council Opening remarks by the Executive Director
9:30 - 10.30	Presentations by Members of the Panel
10:30 - 11:00	Discussion among Members of the Panel
11:00 - 11:15	Coffee
11:15 - 12:45	General Discussion introduced by The Honourable D.F. McArthur, Saskatchewan Minister of Education
12:45 - 1:00	Concluding remarks by Dr. Leo Yaffe, Vice-Principal, McGill University
1:00	Lunch

Dr. A.N. Bourns, President, McMaster University; Association of Universities and Colleges of Canada / Association des universités et collèges du Canada

M. André Fortier, Président, Conseil de recherches en sciences humaines / President, Social Sciences and Humanities Research Council

Dr Claude Fortier, Président, Conseil des sciences du Canada / Chairman, Science Council of Canada

M. Gilles Julien, Directeur général, Conseil de recherches en sciences naturelles et en génie / Executive Director, Natural Sciences and Engineering Research Council

M. Maurice L'Abbé, Directeur général, Conseil des sciences du Canada / Executive Director, Science Council of Canada

Mr. Donald B. Ogaranko, Department of Advanced Education and Manpower, Alberta; and representative of the Council of Ministers of Education

Dr. Donald C. Savage, Executive Secretary, Canadian Association of University Teachers / Secrétaire général, Association canadienne des professeurs d'université

Dr René Simard, Président, Conseil de recherches médicales / President, Medical Research Council

Ms. Helen Baxter, Editor, Canadian Association of University Teachers Bulletin

M. Jean-Marc Carpentier, Radio-Canada

Ms. Trish Crawford, Toronto Star

M. Denis Dion, La Presse

Ms. Lydia Dotto, Journalist

Dr. Peter Forsyth, President, Canadian Association of Physicists

Mr. Allen K. Gillmore, Vice-Rector (Administration), University of Ottawa; Executive Director, Association of Universities and Colleges of Canada from 1 July 1980

Dr. James M. Gilmour, Director of Research, Science Council of Canada

M. Yves Giroux, Vice-recteur, Université Laval; Rédacteur-en-chef, le bulletin de l'Association canadienne d'administrateurs de recherche universitaire

M. Denis Hudon, Secrétaire du ministère d'État aux sciences et à la technologie

Dr. D. G. Hurst, Honorary Executive Director, Royal Society of Canada

Mr. Gordon Hutchison, Electronics Communicator

Dr. A. Marino Kristjanson, Director, National Programs, Association of Universities and Colleges of Canada

M. Gilbert Laporte, Directeur de la recherche, École des Hautes Études Commerciales; Secrétaire-trésorier, Association canadienne d'administrateurs de recherche universitaire

Mme Paule Leduc, Présidente, Conseil des Universités, Québec

Dr. K.T. Leffek, Dean, Faculty of Graduate Studies, Dalhousie University; President, Canadian Association of Graduate Schools

Dr. Donald J. Le Roy, Science Adviser, Science Council of Canada

M. René Lévesque, Vice-recteur, Université de Montréal; Président de SCITEC

Dr. David I.R. Low, Assistant Secretary, University Branch, Ministry of State for Science and Technology

The Honourable D.F. McArthur, Minister of Education and Continuing Education, Saskatchewan

Ms. Maureen McEvoy, President, Canadian University Press

Mr. Jorge Miedzinski, Deputy Executive Director, Science Council of Canada

Mr. Leslie Millin, Secretary of the Science Council of Canada

Ms. Margaret Nevin, CBC Radio News

Ms. Marlene Orton, Canadian Press

M. Jean-Guy Paquet, Recteur, Université Laval; membre du Comité permanent de la recherche auprès du Conseil des sciences

Mr. Jeff Parr, National Union of Students

M. Gilles Provost, Le Devoir

M. Marc Provost, Professeur, Université du Québec à Trois Rivières

Dr. P.A. Redhead, Group Director, Physical and Chemical Science Laboratories, National Research Council; Member, Standing Committee on Research, Science Council of Canada

Dr. Edward Sheffield, Professor Emeritus, Higher Education, University of Toronto

Ms. Valerie Shore, Associate Editor, University Affairs

Mr. Bob Steklasa, Financial Post

M. Pierre Tremblay, Rédacteur-en-chef, Le Droit

M. Robert Trempe, Responsable de la liaison - enseignement post-secondaire et formation professionnelle, Conseil des ministres de L'Education du Canada

Dr. John Trent, Executive Director, Social Science Federation of Canada

Mme Vaira Vikis-Freibergs, professeur de psychologie, Université de Montréal

Dr. Bob Willes, Executive Secretary for Science Policy, Canadian Federation of Biological Societies

Dr. Leo Yaffe, Vice-Principal, McGill University; President-elect, Chemical Institute of Canada

1. **The federal government should finance a major study, sponsored by the Association of Universities and Colleges of Canada, in collaboration with the Canadian Association of University Teachers, on the magnitude and nature of the turnover of academic staff in Canadian universities and on the factors which encourage or inhibit turnover.**

The absence of portability clauses in pensions is certainly one obstacle to turnover. Therefore,

2. **It is incumbent on the universities to play an active role in investigating and promoting mechanisms for achieving pension portability.**

To indicate concern for the maintenance of scholarship of the highest quality,

3. **Universities should grant special status to outstandingly productive staff members upon retirement and encourage them to continue their work.**

Many universities are coming to the realization that their resources are being drained through offering courses and programs that require specialized staff and expensive equipment or library holdings, but attract relatively small numbers of students. In the interests of good scholarship, as well as economy,

4. **Inter-university transfers of staff and facilities should be undertaken whenever research and/or teaching in a specialized area falls below the critical mass for productive scholarship in a particular university.**

Although universities have cooperated in the past, they will have to do so to a much greater extent in the future if the quality of teaching and research is to be preserved and improved. For example, there are seven major cities in Canada with two or more universities. It is strongly recommended that

5. **Universities in adjacent centres should make efforts to develop joint graduate programs in appropriate disciplines, along the lines established by the Guelph-Waterloo Centre for Graduate Work in Chemistry.**

Although in the past, provincial governments have depended largely on federal agencies to provide direct support for research, many areas of provincial concern and jurisdiction would benefit from a more active provincial role. It is therefore recommended that

6. **The provinces should consider establishing research chairs in their universities in disciplines or sub-disciplines with particular relevance to provincial responsibilities and priorities.**

As enrolment declines, the ability of the universities to hire new staff will be reduced. However, the present age structure is such that about 30 per cent of the existing faculty will retire within a ten-year period, beginning in 1993.

7. **To avoid lowering standards or having to hire large numbers of faculty from outside Canada, the provinces should make it possible for the universities to spread the acquisition of new faculty over several years, beginning well before 1993.**

A major challenge for the new Natural Sciences and Engineering Research Council (NSERC) will be to develop methods for preserving and enhancing the quality of research that do not rely on the teaching requirements of the universities to provide competent young recruits.

8. **NSERC should take immediate steps to establish a program of Research Associateships, analogous to the Scholarships of the Medical Research Council, awarded on a highly selective basis, and tenable in Canadian universities for up to five years.**

Re-institution of the awarding of Career Investigatorships by MRC, or the adoption of such a policy by NSERC, is not recommended. However,

9. **Both should monitor the situation as time goes on and be prepared to extend the period of tenure of MRC Scholarships and the proposed NSERC Research Associateships beyond five years, if this should appear to be necessary.**

There has been, in Canada, a tendency to downgrade basic research and to encourage universities to re-direct their efforts toward tackling the practical problems of government and the private sector. Such a policy could be self-defeating in the long run.

10. **The integrity of basic research in science and engineering in our universities must be preserved, but, in doing so, emphasis must be placed on mechanisms for achieving spin-off.**

Present circumstances are accentuating the importance of establishing closer links between universities and the private sector. In the applied sciences in particular, greater complementarity in research and improved mechanisms for achieving spin-off from university research are needed. A prerequisite is that applied scientists in universities gain first hand knowledge of the industrial sector. As a proven but little used method of accomplishing this objective,

11. The Natural Sciences and Engineering Research Council should take the steps necessary to expand its Senior Industrial Fellowships program by a factor of ten.

One of the main obstacles to the expansion of NSERC's Senior Industrial Fellowship program is the generally negative attitude of the universities toward allowing their staff to gain practical industrial experience.

12. The universities should recognize that by encouraging their staff to spend a year in the private sector they will increase the potential of making significant contributions to industrial performance and, at the same time, stimulate the most important market for their graduates.

Although the private sector will undoubtedly become the most important outlet for highly qualified manpower in science and engineering, this development must be stimulated. The Industrial Postdoctoral Fellowships program of NSERC has been effective, but it lacks the necessary scope for reaching its optimum potential.

13. The Natural Sciences and Engineering Research Council should attempt to at least double the present size of its Industrial Postdoctoral Fellowships program through a campaign to expand the number and types of participating companies.